# This Page Is Inserted by IFW Operations and is not a part of the Official Record

### **BEST AVAILABLE IMAGES**

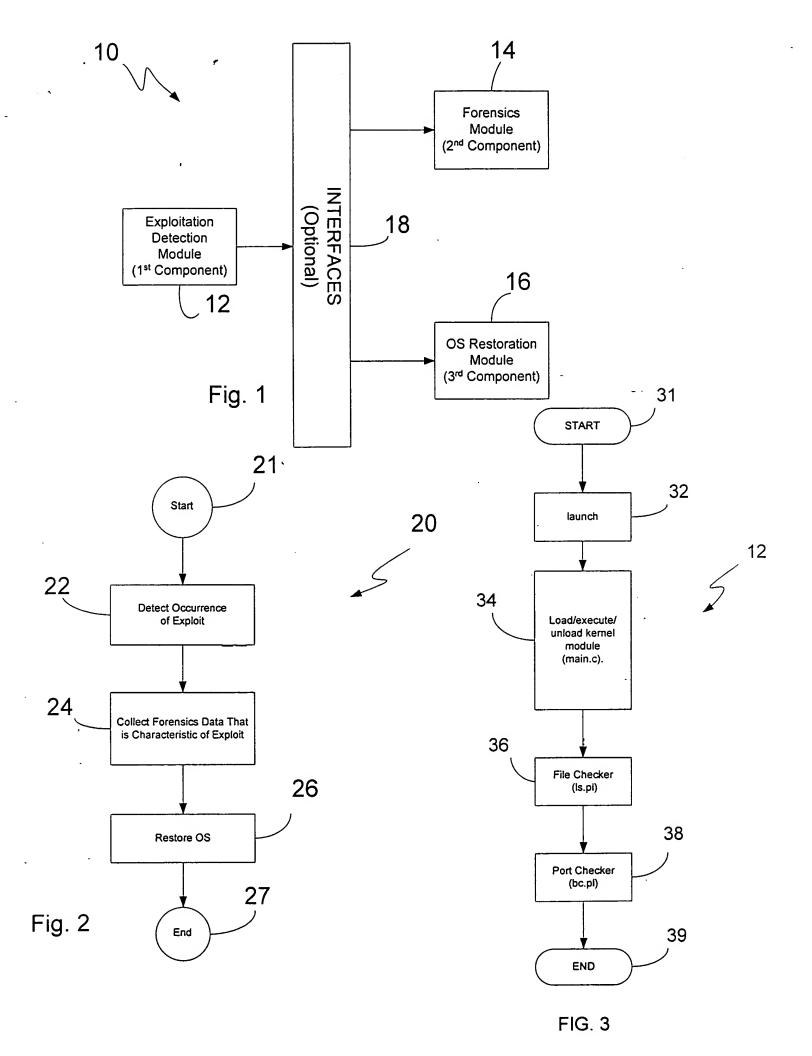
Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

## IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents will not correct images, please do not report the images to the Image Problem Mailbox.



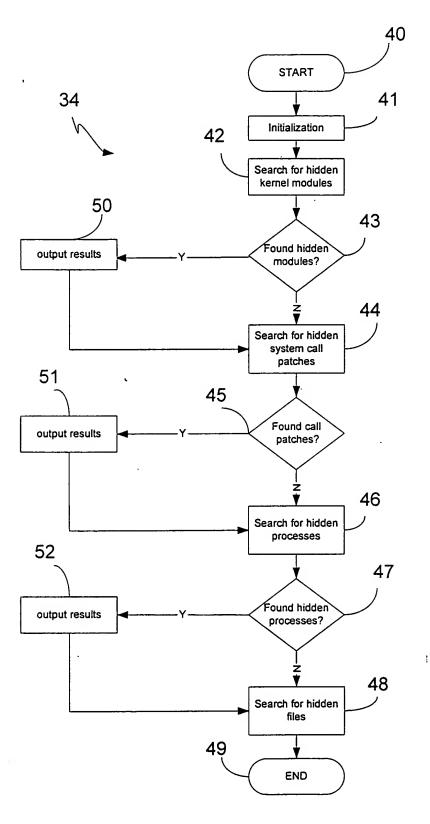
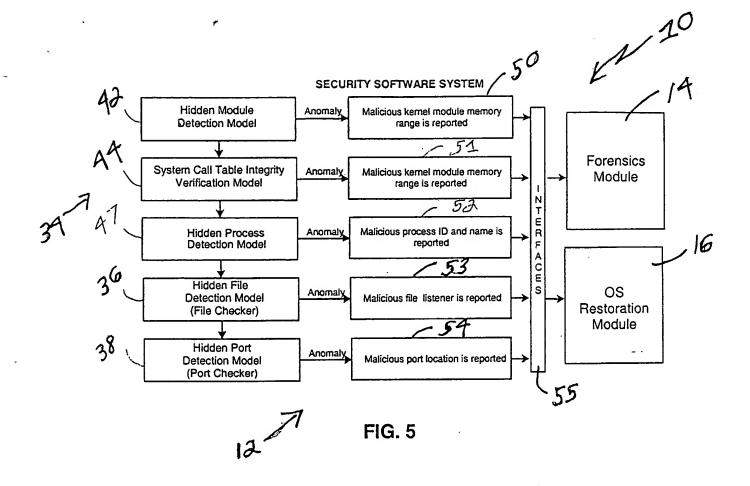
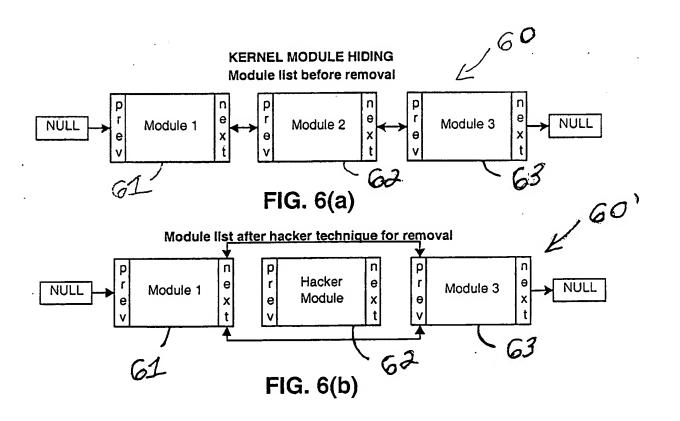


FIG. 4





#### HIDDEN KERNEL MODULE DISCOVERY MODEL

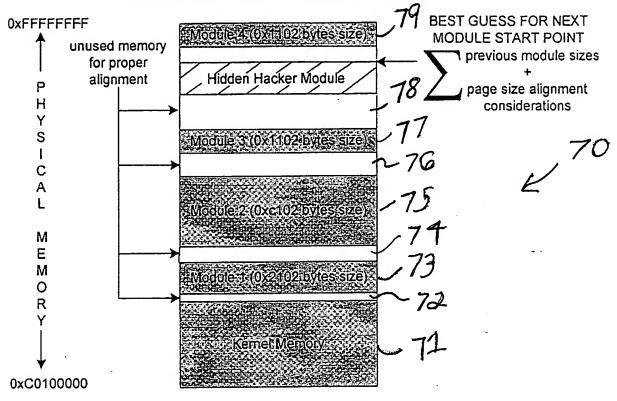


FIG. 7

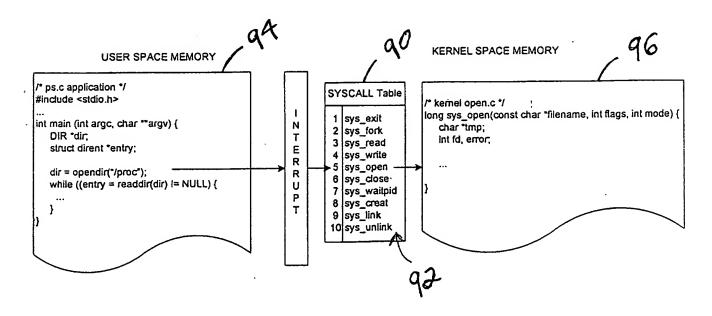


FIG. 9

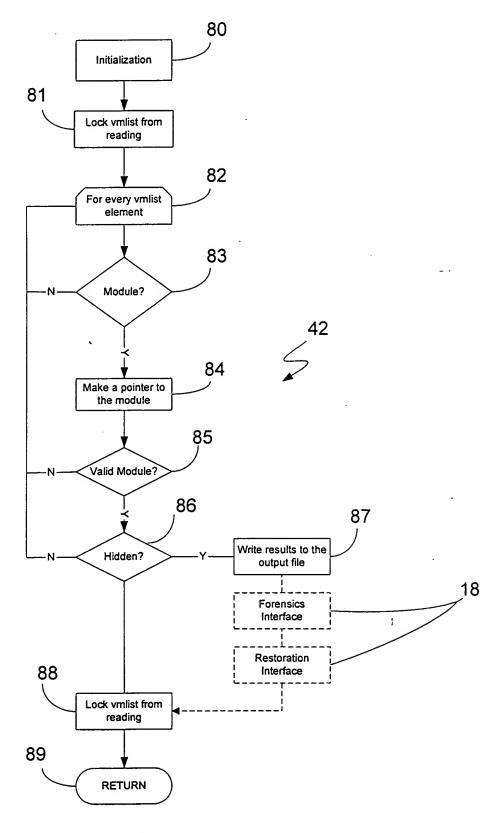
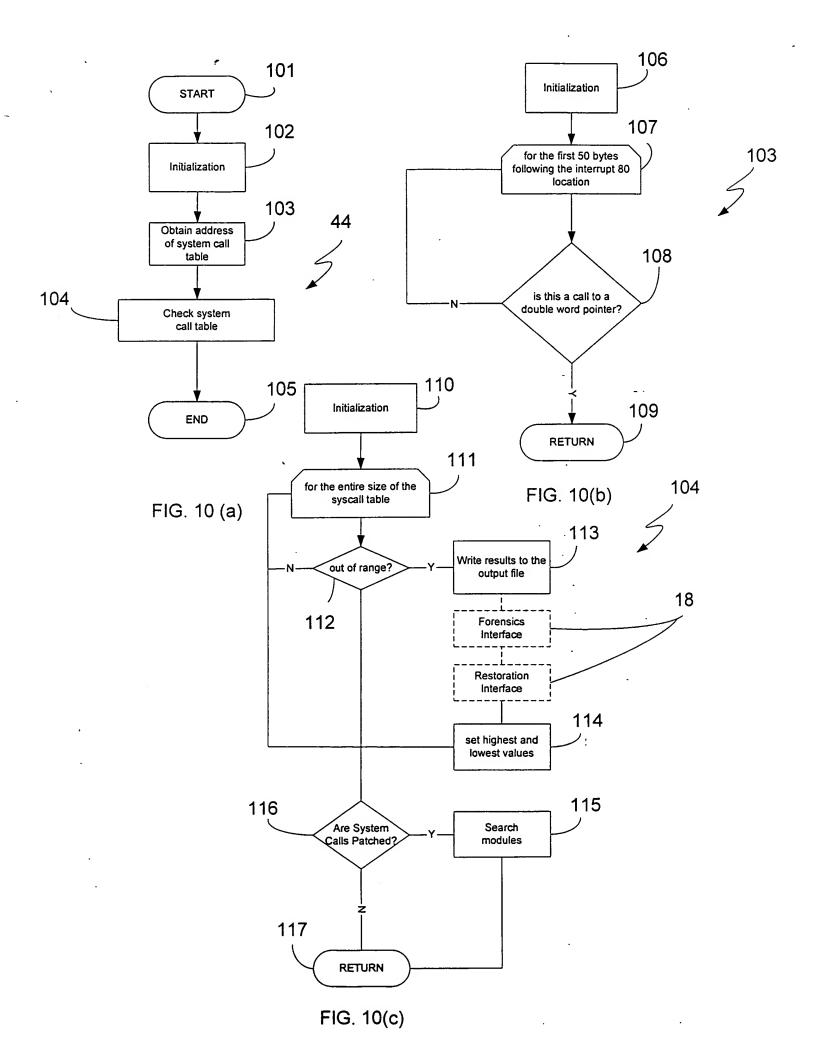


FIG. 8



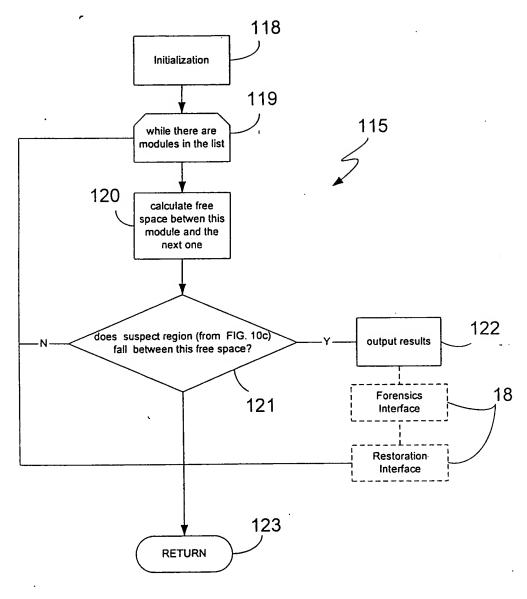


FIG. 10(d)

#### IDENTIFIED SYSCALL ANOMALIES CAUSE BY ADORE v0.42

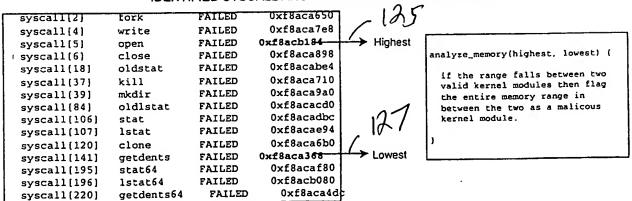
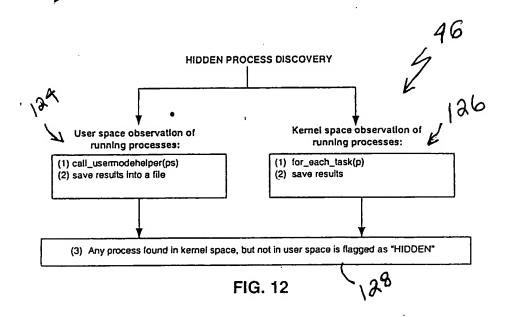
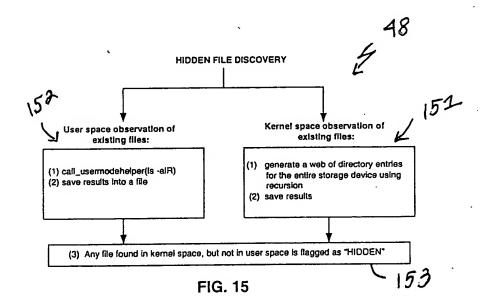


FIG. 11





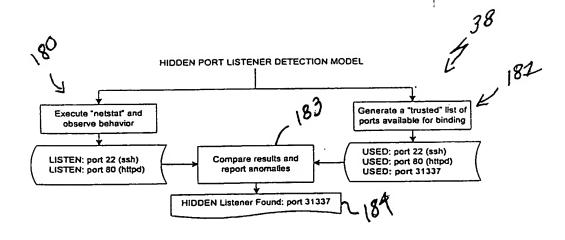
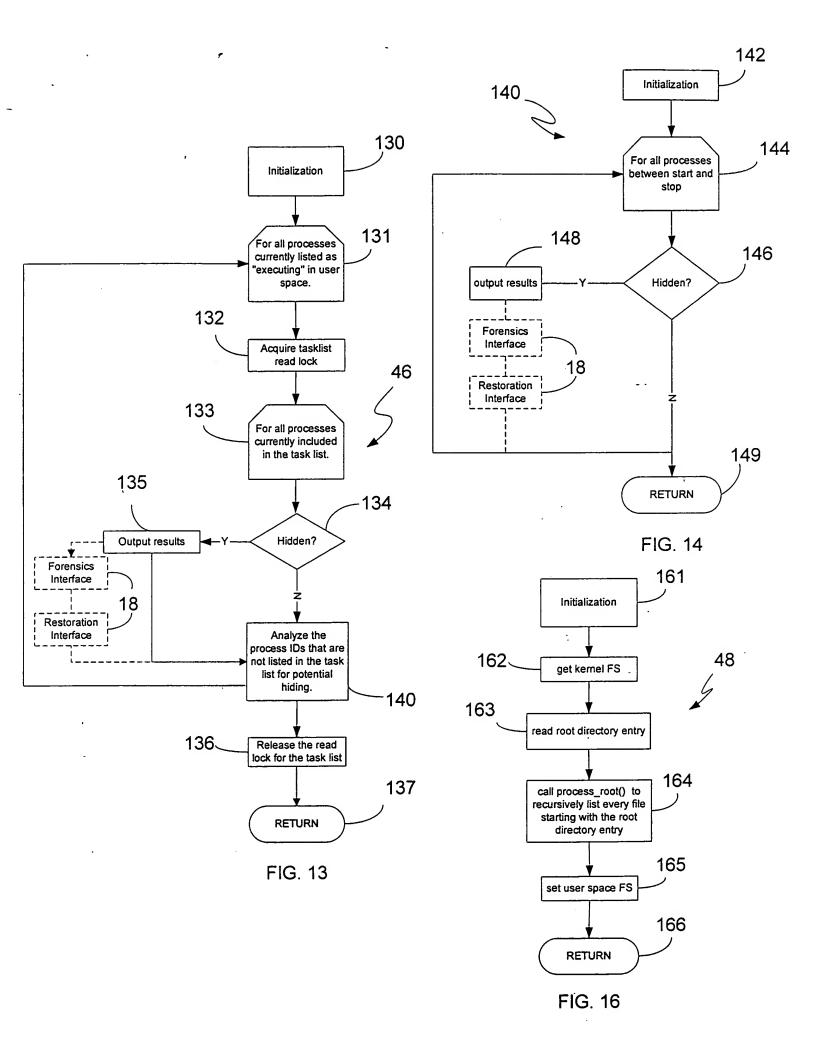


FIG. 18



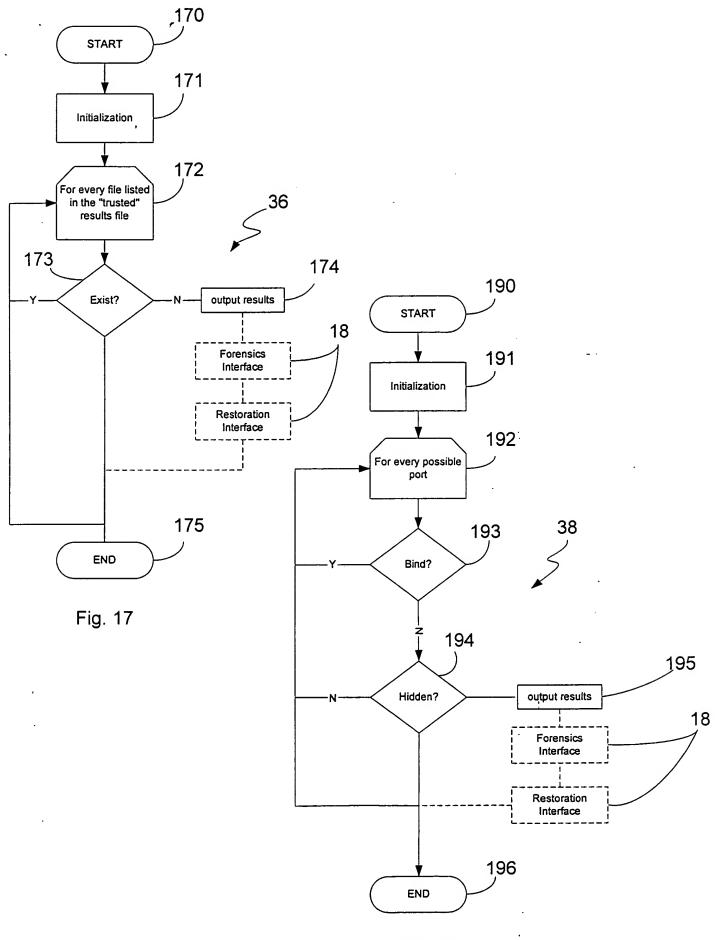


FIG. 19

```
Script started on Sat Aug 9 15:42:00 2003
[root@localhost interrogator] # ./interrogator
Where would you like the results stored? [/tmp/interrogator/]
Check for hidden processes? [Y]
Check for hidden TCP port listeners? [Y]
Check for system call patching? [Y]
Check for hidden kernel modules? [Y]
Check for hidden files? (may take > 15 minutes) [N] Y
Running the interrogator_ this may take a minute
Results are located at /tmp/interrogator/summary
View results now? [Y]

No hidden modules were found.
No system call table modifications were found.
No hidden processes were found.
WARNING: File size is 60133 (should be 58885): /var/log/sa/sa09
WARNING: File size is 1010871 (should be 1010003): /var/log/cron
WARNING: File size is 597700 (should be 597264): /var/log/maillog
No hidden files were found.
No hidden TCP port listeners were found.
[root@localhost interrogator] # exit
Script done on Sat Aug 9 16:01:52 2003

FIG. 20(a)
```

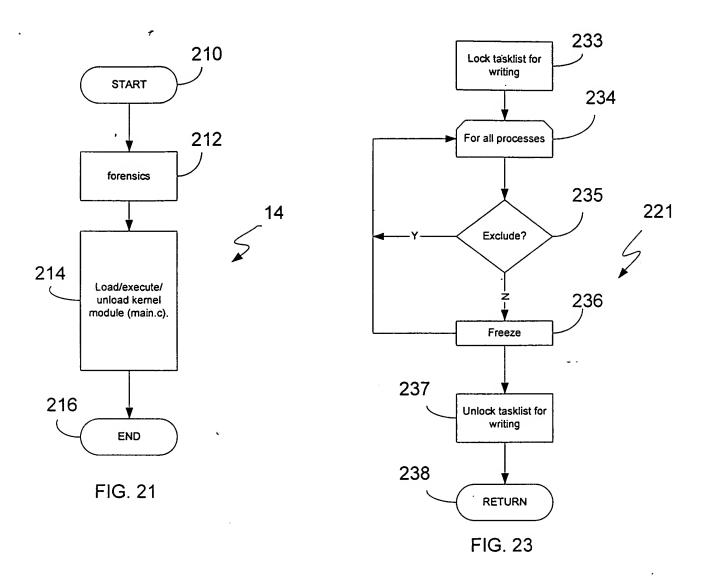
```
[root@localhost interrogator]# ./interrogator
Where would you like the results stored? [/tmp/interrogator/]
Check for hidden processes? [Y]
Check for hidden TCP port listeners? [Y]
Check for hidden TCP port listeners? [Y]
Check for hidden kernel modules? [Y]
Check for hidden files? (may take > 15 minutes) [N] Y
Running the interrogator. this may take a minute
Results are located at /tmp/interrogator/summary
View results now? [Y]

NO hidden modules were found.
NO system call table modifications were found.
WARNING: process id 13745 hidden or just exited (tb)
Launch Path: /root/code/interrogator/de*rojansans/tb
POUND 1 Hidden process listing
HIDDEN File found: /tmp/hideme
WARNING: File size is 62629 (should be 61381): /var/log/sa/sa09
WARNING: File size is 1013693 (should be 1012816): /var/log/cron
WARNING: File size is 599450 (should be 599012): /var/log/maillog
HIDDEN TCP Port Listener found: port 2222
[root@localhost interrogator]# exit
```

FIG. 20(b)

```
[root@localhost interrogator] # ./interrogator
   [root@localhost interrogator] # ./interrogator
Where would you like the results stored? [/tmp/interrogator/]
Check for hidden processes? [Y]
Check for hidden TCP port listeners? [Y]
Check for system call patching? [Y]
Check for hidden kernel modules? [Y]
Check for hidden files? (may take > 15 minutes) [N] Y
Running the interrogator... this may take a minute
Results are located at /tmp/interrogator/summary
View results now? [Y]
    View results now? [Y]
                 ----[ SUMMARY ]-----
   WARNING suspect module found: f8a0f000 8000 bytes (adore) Image stored at /tmp/interrogator/adore.o FOUND 1 HIDDEN module loaded
    WARNING: Deviations found in the sys_call_table syscall(2) FAILED 0xf8a0f650 fork
                              PAILED
                                            0xf8a0f7e8
                                                                      write
                                            0xf8a10184
    syscall[5]
                              PAILED
                                                                      open
                                            0xf8a0f898
    syscall(6)
                              FAILED
                               PAILED
                                            0xf8a0fbe4
                                                                       oldstat
    syscall (18)
                                           0xf8a0f710
0xf8a0f9a0
    syscall(37)
                              FAILED
                                                                      kill
                                                                      mkdir
                              FAILED
    syscal1(39)
    syscall[84]
                               FAILED
                                                                      oldlstat
                                            0xf8a0fcd0
    syscall[106]
                               FAILED
                                           0xf8a0fdbc
0xf8a0fe94
                                                                       stat
                              FAILED
                                                                      lstat
    syscall [107]
                                          0xf8a0f6b0
0xf8a0f368
0xf8a0ff80
                               FAILED
    syscall (120)
                               PAILED.
                                                                       getdents
                                                                      stat64
    syscal1[195]
                              FAILED
                                            0xf8a10080
                              FAILED
    syscall [196]
    syscall(220) PAILED Oxf8a0f4dc getdents64
Suspect module located (0xf89da6d8 - 0xf8a12000)
    POUND 15 Modified syscall table functions
    WARNING: Found process id 836 removed from the task_queue.
Launch Path: /root/code/interrogator/demo/trojans/test
WARNING: process id 13745 hidden or just exited (tb)
     Launch Path: /root/code/interrogator/demo/trojans/tb
    FOUND 2 Hidden process listings
    HIDDEN File found: /tmp/hideme
WARNING: Pile size is 2336990 (should be 2335392): /var/log/messages
    HIDDEN TCP Port Listener found: port 111
    HIDDEN TCP Port Listener found: port 139
HIDDEN TCP Port Listener found: port 2222
    HIDDEN TCP Port Listener found: port 6000
HIDDEN TCP Port Listener found: port 32768
HIDDEN TCP Port Listener found: port 32769
     [root@localhost interrogator]# exit
                                             FIG. 20(c)
[root@localhost interrogator]# ./interrogator
Where would you like the results stored? [/tmp/interrogator/]
Check for hidden processes? [Y]
Check for hidden TCP port listeners? [Y]
Check for system call patching? [Y]
Check for hidden kernel modules? [Y]
Check for hidden files? (may take > 15 minutes) [N] Y Running the interrogator... this may take a minute Results are located at /tmp/interrogator/summary
                                                                                                          206
View results now? [Y]
WARNING suspect module found: f8a10000 184700 bytes (homegrown)
FOUND 1 HIDDEN module loaded
WARNING: Deviations found in the sys_call_table
                            FAILED 0xf8a11494
                                                                      read
                                                                      open
syscall(5)
                            PAILED 0xf8a11020
syscall[11]
                            FAILED
                                          0xf8a10ebc
                                                                      execve
                                          0xf8a118a0
syscall[13]
                            FAILED
                                                                      time
                                                                      gettimeofday
syscall (78)
                            FAILED
                                          0xf8a1183c
syscall[141]
                            FAILED
                                          0xf8a11544
                                                                      getdents
                                                                      getdents64
                            FAILED
                                        0xf8a116c0
syscal1 [220]
Suspect module located (0xf89db6d8 - 0xf8a3f000) POUND 7 Modified syscall table functions
WARNING: process id 1584 hidden or just exited (tb)
Launch Path: /root/code/interrogator/demo/trojans/tb
FOUND 1 Hidden process listing
HIDDEN File found: /tmp/hideme
WARNING: File size is 1021523 (should be 1020648): /var/log/cron
WARNING: File size is 603820 (should be 603384): /var/log/maillog
HIDDEN TCP Port Listener found: port 2222
```

[root@localhost interrogator] # exit



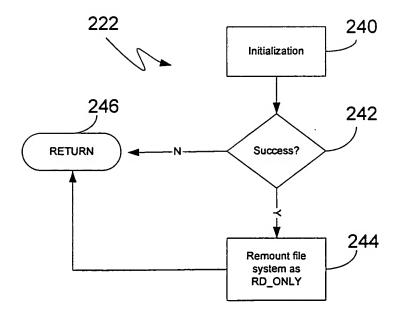
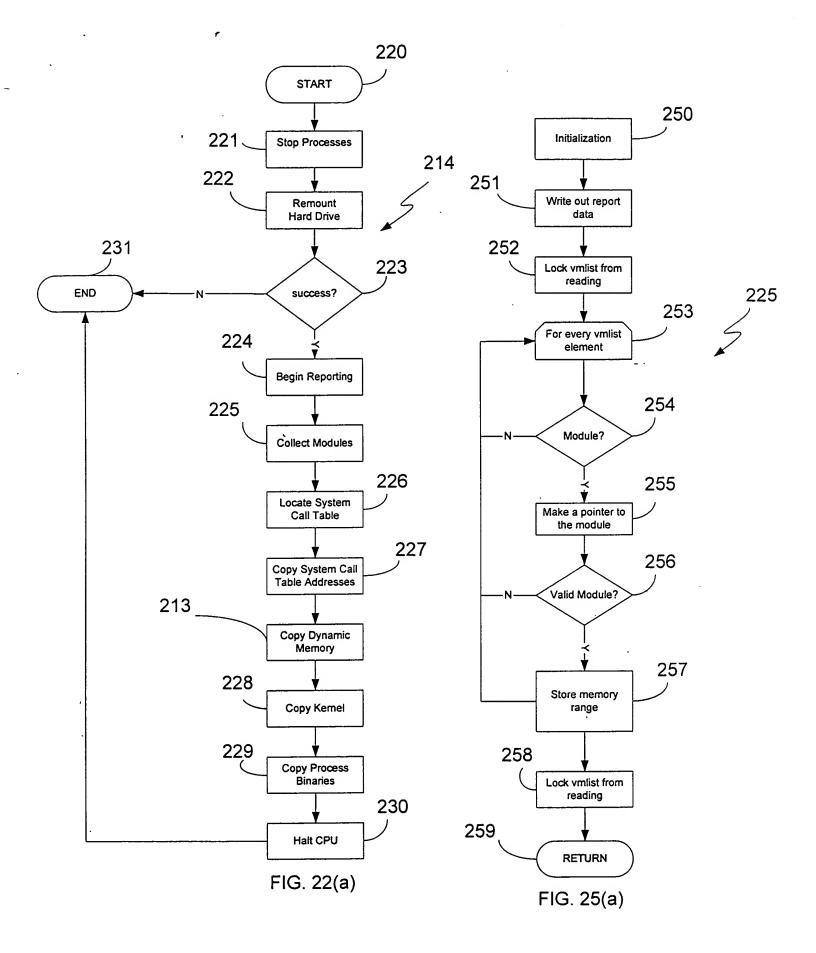
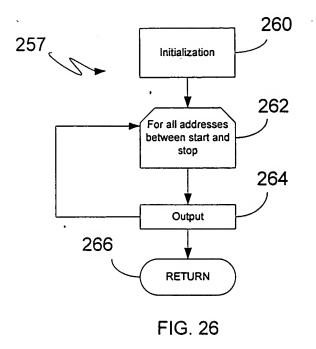
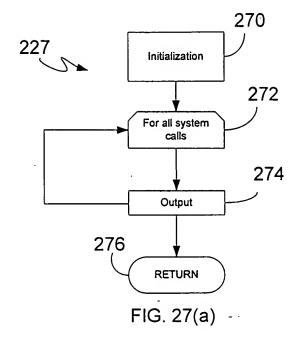


FIG. 24







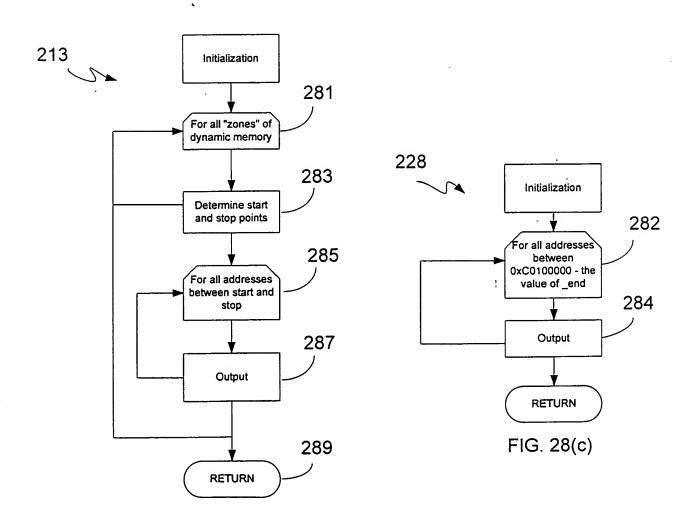


FIG. 28(a)

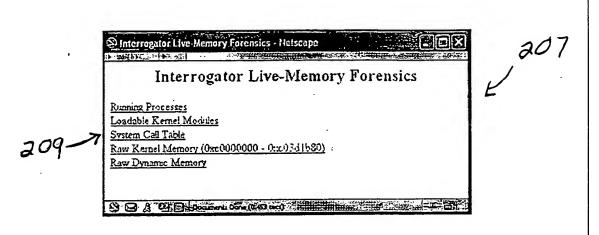


FIG. 22(b)

	213	-215	217 219 2211				
Loadable Kernel Mod	lules Netscape		20				
<u>de-cd</u>	33608	0	0xd08e6000 - 0xd08ee348				
mhais	37228	4	0xd08f0000 - 0xd08f916c				
o tables	14936	2	0xd08fb000 - 0xd08fea58				
otable filter	2412	ģ1	0xd0900000 - 0xd090096c				
ık 1608859-1	3516	1	0xd0902000 - 0xd0902dbc				
ocnet32	17856	<b>1</b> 1	0xd0906000 - 0xd090a5c0				
pt REJECT	3736	6	0xd090e000 - 0xd090ee98				
urofs	13348	<b>(</b> 0	0xd0910000 - 0xd0913424				
oundcare	6532	0	0xd0970000 - 0xd0971984				
t mod	18136	(O	0xd0995000 - 0xd09996d8				
isb-storage	62000	it	0xd09ce000 - 0xd09dd230				
<u>at</u>	38712	<b>j</b> o	0xd09df000 - 0xd09e8738				
र्रिको	13084	1	0xd09ea000 - 0xd09ed31c				
ds cp437	5116	)1	0xd09ef000 - 0xd09f03fc				
ickre	7968	0	0xx092000 - 0xd095320				

Day

FIG. 25(b)

System Call Table							
System Call	Address	NAME	ì				
SyscaE[1]	0xc011e1d0	exit					
Syscal[2]	0::30312650	fork					
Syscall(3)	0xc013fb70	read					
Syscall(4)	0xd09f27e3	write					
Syscal[5]	0xd09f3134	open					
SyscaE[6]	0x309£2898	close					
Syscat(7)	0xc011e5b0	waitpid	For indicate a				
Syscal(8)	0xc013f180	creat -					
Syscall(9)	0xc014cb10	linik					

FIG. 27(b)

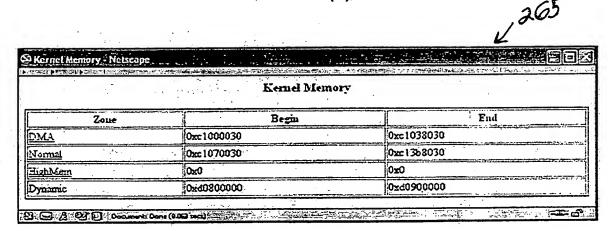


FIG. 28(b)

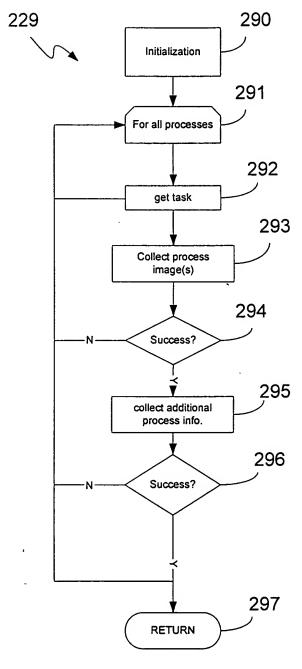
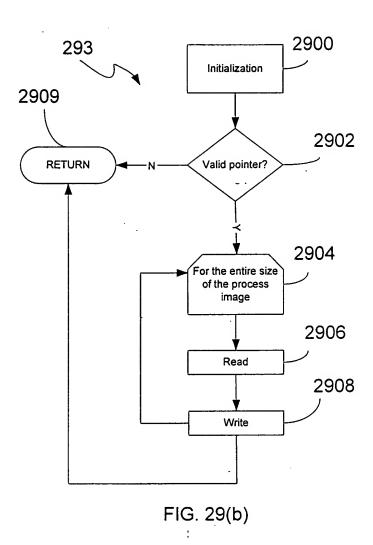
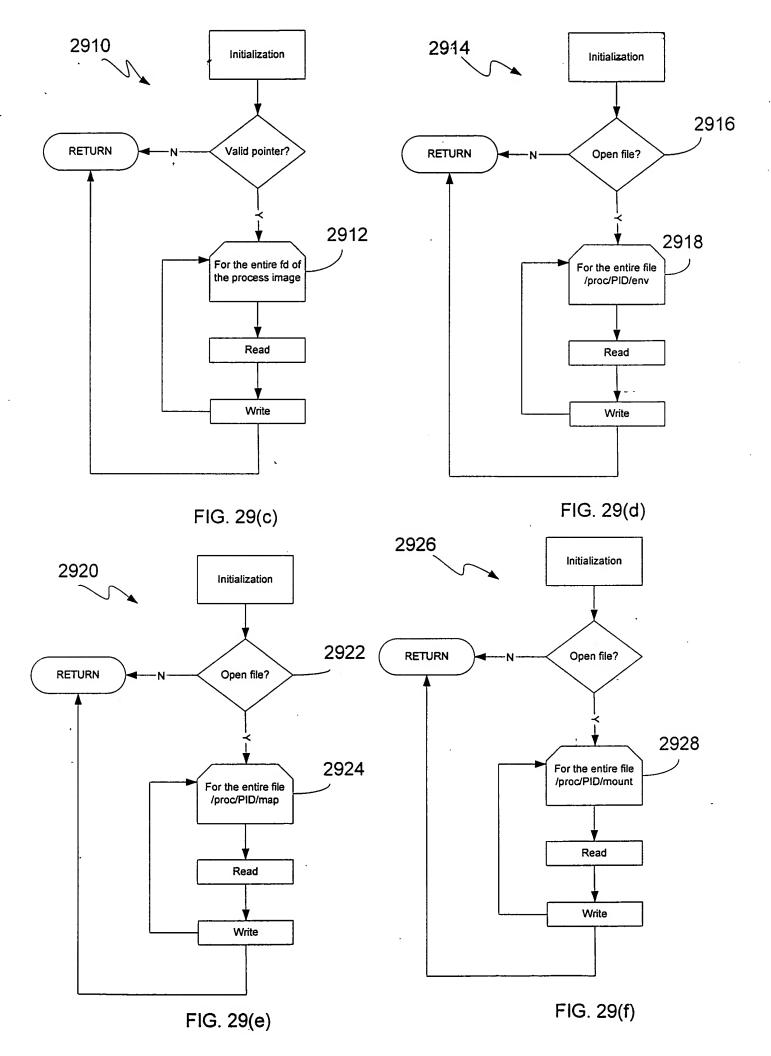


FIG. 29(a)





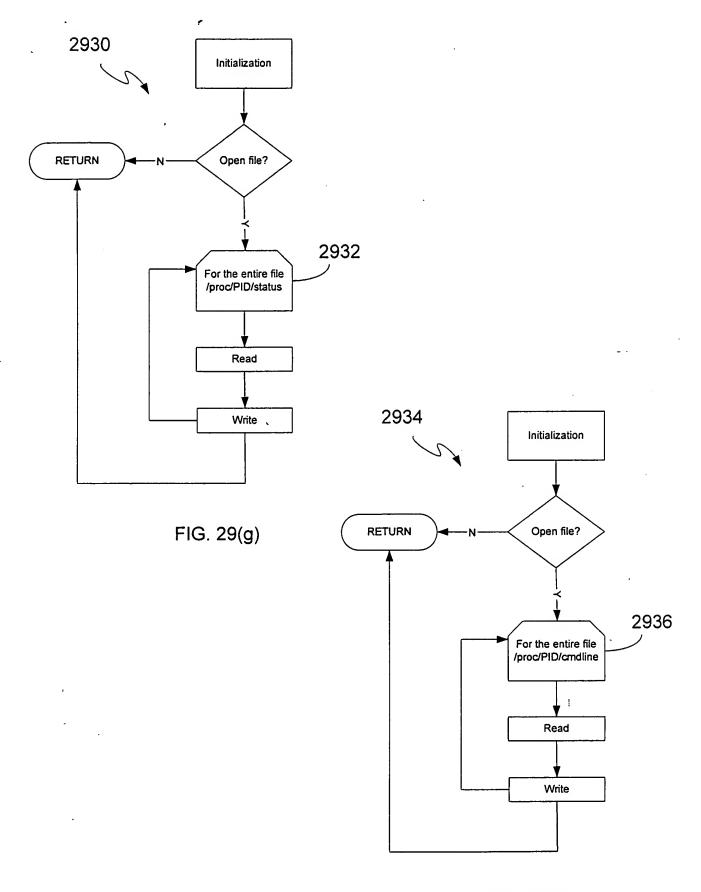


FIG. 29(h)

Running Process Listing										
Process	Proc Image	Mem Image	File Descriptors		Mapping	Command	Mounts	Srams		
rii	<u>L</u>	1	Ū.	ear/	mere	command	mount	status		
vmware-guestd	327	<u>1327</u>	4	env	mar.	sommand	mount	status		
dhobens	529	529	3	<u>e07</u>	map .	command	moreti	212102		
syslogd	582	582	2	en7	UI 2D	command	্ৰতত্ত্বা	status		
klogd	\$86	<u>536</u>	2	env	map	command	mount	zzisz:		
portmap	<u>603</u>	503	2	CD7	<u> m.xp</u>	command	anovini	2304		
rpe.staid	622	622	7	env	mar	countrad	enount	zatus		
apmd	703	703	[2	env	mao	command	mount	status		
sshd	741	741	4	enz	කුදුදු	command	<u>meunt</u>	zran:		
zinetd	755	755	16	עמס	mag	command	mount	etarus		
sendmail	7778	857	2	eny	maa	command	moun:	312276		
sendmail	788	733	<u>[4</u>	znz znz	TO AT	<u>command</u>	mount	stabis		
gpm	798	798	12	eny	map	command	(प्रकाय)	220013		
crond	807	307	5	CDA	map	command	mount	status.		
zfi:	341	341	6	env	juar	seemmand	mount	status		
ard	<u>859</u>	859	4	<b>छ</b> द	unas mas	command	mount	status.		
10 10 10 10 10 10 10 10 10 10 10 10 10 1	262	252	160	Tens:	mm	frommand.		CEATE .		

267

FIG. 29(i)

```
269
total 13696
                                      4096 Jan 5 19:41 .
drwxr-xr-x
              2 root
                          root.
                                        4096 Jan
                                                  5 22:26 ..
                          root
drwxr-xr-x
             11 root
                                                  5 19:40 1.exe
-rwxr-xr-x
              1 root
                          root
                                       33960. Jan
                                       33960 Jan 5 19:40 1.mem_exe
                          root
-rwxr-xr-x
              1 root
                                     103165 Jan 5 19:40 327.exe
-rwxr-xr-x
              1 root
                          root
                                      103165 Jan
                                                  5 19:40 327.mem_exe
                          root
              1 root
-rwxr-xr-x
                                      390950 Jan 5 19:40 529.exe
-rwxr-xr-x
              1 root
                          root
                                      390950 Jan 5 19:40 529.mem_exe
                          root
              1 root
-rwxr-xr-x
                                      33635 Jan 5 19:40 582.exe
-rwxr-xr-x
              1 root
                          root
              1 root
                          root
                                       33635 Jan
                                                  5 19:40 582.mem_exe
-rwxr-xr-x
                                       28571 Jan 5 19:40 586.exe
-rwxr-xr-x
              1 root
                          root
                          root
                                       28571...Jan.
                                                  5 19:40 586.mem_exe
-rwxr-xr-x
              1 root
                                      40144-Jan 5 19:40 603.exe
38147-Jan 5-19:40 603.mem_exe
=rwxr-xr-x 1 root ==
-rwxr-xr-x 1 root ==
                          root
```

FIG. 30(a)

```
fd: 0 READ-WRITE /socket:/[1103]
fd: 1 WRITE-ONLY /var/log/messages
fd: 2 WRITE-ONLY /var/log/secure
fd: 3 WRITE-ONLY /var/log/maillog
fd: 4 WRITE-ONLY /var/log/spooler
fd: 5 WRITE-ONLY /var/log/spooler
fd: 6 WRITE-ONLY /var/log/boot.log
```

SSH\_AGENT\_PID=4606 HOSTNAME=sring-1.internal.vlan.iwc.sytexinc.com PVM\_RSH=/usr/bin/rsh SHELL=/bin/bash 273 L TERM=xterm HISTSIZE=1000 GTK\_RC\_FILES=/etc/gtk/gtkrc:/root/.gtkrc-1.2-gnome2 WINDOWID=27270368QTDIR=/usr/lib/qt-3.1 USER=root LS COLORS= PVM\_ROOT=/usr/share/pvm3 SSH\_AUTH\_SOCK=/tmp/ssh-XX3Bs0yB/agent.4542 SESSION\_MANAGER=local/sring-1.internal.vlan.iwc.sytexinc.com:/tmp/.ICEunix/4542 USERNAME=root MAIL=/var/spool/mail/root PATH=/usr/kerberos/sbin:/usr/kerberos/bin:/usr/local/sbin:/usr/local/bin:/sbin :/bin:/usr/sbin:/usr/bin:/usr/X11R6/bin:/root/bin:/usr/local/netscape INPUTRC=/etc/inputrc PWD=/root XMODIFIERS=@im=none LANG=en\_US.UTF-8 LAMHELPFILE=/etc/lam/lam-helpfile GDMSESSION=Default SSH\_ASKPASS=/usr/libexec/openssh/gnome-ssh-askpass HOME=/root SHLVL=2X PVM\_ROOT=/usr/share/pvm3/xpvm GNOME\_DESKTOP\_SESSION\_ID=Default BASH\_ENV=/root/.bashrc LOGNAME=root LESSOPEN=|/usr/bin/lesspipe.sh %s DISPLAY=: 0.0G\_ BROKEN\_FILENAMES=1 COLORTERM=gnome-terminal XAUTHORITY=/root/.Xauthority\_=/usr/bin/ssh

FIG. 30(c)

rootfs / rootfs rw 0 0
/dev/root / ext3 ro 0 0
/proc /proc proc rw 0 0
usbdevfs /proc/bus/usb usbdevfs rw 0 0
/dev/sdal /boot ext3 rw 0 0
none /dev/pts devpts rw 0 0
none /dev/shm tmpfs rw 0 0
none /mnt/hgfs vmware-hgfs rw,nosuid,nodev 0 0
/dev/sdbl /mnt vfat rw 0 0

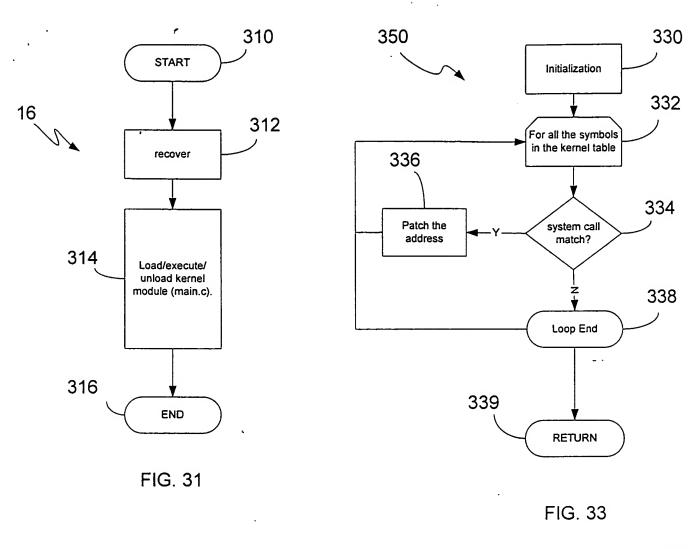
1275

FIG. 30(d)

Name: vmware-questd State: R (running) 327 Tgid: Pid: 327 PPid: 1 n TracerPid: 0: Uid: 0 0 Gid: a FDSize: 32 Groups: VmSize: 1424 kB 0 kB VmLck: 444 kB VmRSS: 48 kB VmData: 8 kB VmStk: 84 kB VmExe: 1252 kB VmLib: SigPnd: 0000000000000000 SigBlk: 00000000000000000 SigIgn: 80000000000000000 SigCgt: 0000000000004a07 CapInh: 0000000000000000 CapPrm: 00000000fffffeff CapEff: 00000000fffffeff

L 211

0



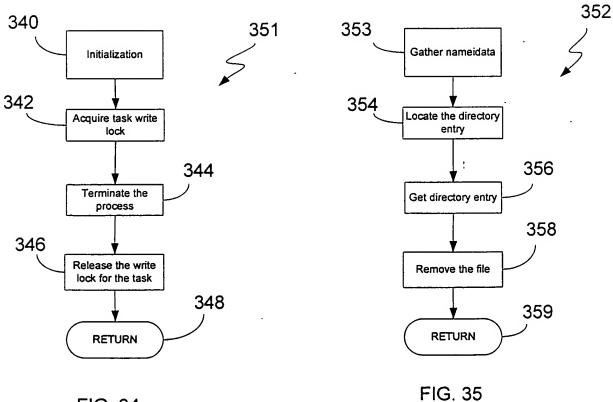


FIG. 34

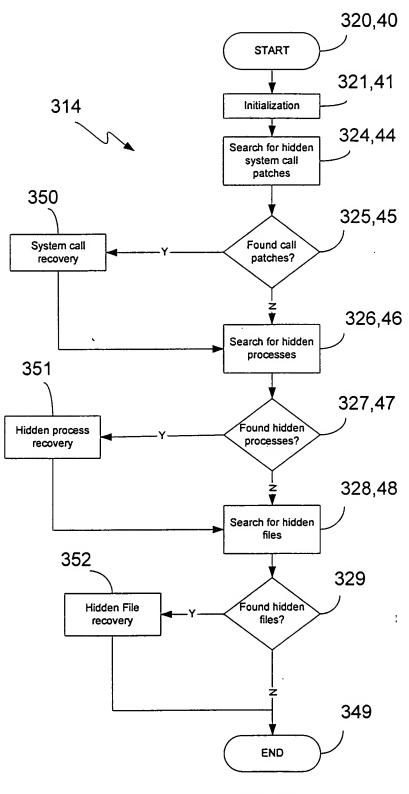


FIG. 32

Script started on Sun Jan 11 10:18:52 2004 [root@localhost recovery]# ./recover
Terminate hidden processes? [Y]
Recover system call table? [Y]
Remove hidden files [N] Y
Results are located at /tmp/interrogator/summary
View results now? [Y]

360 L

2361

NO system call table modifications were found.
NO hidden processes were found.
[root@localhost recovery] # exit
Script done on Sun Jan 11 10:19:03 2004

FIG. 36(a)

Script started on Sun Jan 11 10:31:02 2004 [root@localhost adore]# ./startadore Warning: loading cleaner.o will taint the kernel: no license See http://www.tux.org/lkml/#export-tainted for information about tainted modules Module cleaner loaded, with warnings

[root@localhost adore]# /tmp/test
[root@localhost adore]# ps -ef |grep test
root 1302 1276 0 10:35 pts/3 00:00:00 /tmp/test
root 1304 1043 0 10:35 pts/1 00:00:00 grep test

[root@localhost adore] # ./ava i 1302 Checking for adore 0.12 or higher ... Adore 0.42 installed. Good luck. Made PID 1302 invisible.

[root@localhost adore]# ./ava h /tmp/test
Checking for adore 0.12 or higher ...
Adore 0.42 installed. Good luck.
File '/tmp/test' hided.

[root@localhost adore] # ls /tmp
ssh-XXAbS7W
ssh-XXEZXD3

[root@localhost adore]# ps -ef |grep test
[root@localhost adore]# exit
Script done on Sun Jan 11 10:35:40 2004

FIG. 36(b)

FIG. 36(c)

Script started on Sun Jan 11 10:35:21 2004
[root@localhost recovery]# /tmp/test
Running 1
Running 2
Running 3
Running 4
Running 5
Running 6
Running 7
Hangup

Script done on Sun Jan 11 10:55:12 2004

FIG. 36(d)

```
Script started on Sun Jan 11 10:57:09 2004
[root@localhost recovery] # ls /tmp.
ssh-XXAbS7W
ssh-XXEZXD3
[root@localhost recovery] # sum /tmp/test
                                                  K 364
03965
        12
[root@localhost recovery]# ./recover
Terminate hidden processes? [Y] N
Recover system call table? [Y] N
Delete hidden files? [N] Y
Results are located at /tmp/interrogator/summary
View results now? [Y]
               ----[ SUMMARY ]-----
REMOVED /tmp/test
[root@localhost recovery]# ls /tmp
ssh-XXAbS7W
ssh-XXEZXD3
[root@localhost recovery]# sum /tmp/test
sum: /tmp/test: No such file or directory
root@localhost recovery]# exit
Script done on Sun Jan 11 10:57:47 2004
```

FIG. 36(e)

```
Script started on Sun Jan 11 10:57:57 2004
[root@localhost recovery]# ./recover
Terminate hidden processes? [Y] N
Recover system call table? [Y]
Delete hidden files? [N] N
Results are located at /tmp/interrogator/summary
View results now? [Y]
_____[ SUMMARY ]-----
WARNING suspect module found: d09cb000 7968 bytes (adore)
FOUND 1 HIDDEN module loaded
WARNING: Deviations found in the sys_call_table
                             0xd09cb650
                                               fork
                    FAILED
syscall[2]
                                               write
                    FAILED
                             0xd09cb7e8
syscall[4]
                                               open
                             0xd09cc184
                    FAILED
syscall[5]
                                               close
syscall[6]
                    FAILED
                             0xd09cb898
                             0xd09cbbe4
                                               stat
syscall[18]
                    FAILED
                                               kill
                             0xd09cb710
syscall[37]
                    FAILED
                                               mkdir
                             0xd09cb9a0
                    FAILED
syscall[39]
                             0xd09cbcd0
                                               lstat
syscall[84]
                    FAILED
                             0xd09cbdbc
                                               stat
                    FAILED
syscall[106]
                                               lstat
                             0xd09cbe94
syscall[107]
                    FAILED
                             0xd09cb6b0
                                               clone
                    FAILED
syscall[120]
                                               getdents
                             0xd09cb368
syscall[141]
                    FAILED
                             0xd09cbf80
                                               stat64
                    FAILED
syscall[195]
                             0xd09cc080
                                               1stat64
                    FAILED
syscall[196]
                                               getdents64
                    FAILED
                             0xd09cb4dc
syscall[220]
RECOVERED 15 Modified syscall table functions
[root@localhost recovery]# ./recover
Terminate hidden processes? [Y] N
                                                      1
Recover system call table? [Y]
Delete hidden files? [N] N
Results are located at /tmp/interrogator/summary
View results now? [Y]
_____[ SUMMARY ]-----
NO system call table modifications were found.
```

FIG. 36(f)

```
Script started on Sun Jan 11 11:31:47 2004
[root@localhost adore] # ps -ef | grep test
                                      00:00:00 /tmp/test
         1284 1258 0 11:31 pts/1
(root@localhost adore)# ls /tmp
ssh-XXAbS7W
ssh-XXEZXD3
test
[root@localhost adore]# ./startadore
Warning: loading cleaner.o will taint the kernel: no license
See http://www.tux.org/lkml/#export-tainted for information about tainted modules
Module cleaner loaded, with warnings
[root@localhost adore]# ./ava i 1284
Checking for adore 0.12 or higher ...
Adore 0.42 installed. Good luck.
Made PID 1284 invisible.
[root@localhost adore]# ./ava h /tmp/test
Checking for adore 0.12 or higher ...
Adore 0.42 installed. Good luck.
File '/tmp/test' hided.
[root@localhost adore]# ps -ef |grep test
[root@localhost adore]# ls /tmp
                                                               1300
ssh-XXAbS7W
ssh-XXEZXD3
[root@localhost adore]# cd ../interrogator/recovery
[root@localhost recovery]# ./recover
Terminate hidden processes? [Y] N
Recover system call table? [Y] Y
Delete hidden files? [N] N
Results are located at /tmp/interrogator/summary
View results now? [Y]
_____ [ SUMMARY ] -----
WARNING suspect module found: d09cb000 7968 bytes (adore)
FOUND 1 HIDDEN module loaded
WARNING: Deviations found in the sys_call_table
                              0xd09cb650
                                                 fork
                FAILED
syscall[2]
                                                 write
syscall[4]
                     FAILED
                              0xd09cb7e8
                                                 open
                              0xd09cc184
                    FAILED
syscall [5]
                                                 close
syscall[6]
                     FAILED
                              0xd09cb898
                                                 stat
                              0xd09cbbe4
syscall[18]
                     FAILED
                              0xd09cb710
                     FAILED
                                                 kill
syscall[37]
                                                 mkdir
                              0xd09cb9a0
syscall[39]
                     FAILED
                                                 lstat
                     FAILED
                              0xd09cbcd0
syscall[84]
                              0xd09cbdbc
                                                  stat
                     FAILED
syscall(106)
                              0xd09cbe94
                                                 lstat
syscall[107]
                     FAILED
                              0xd09cb6b0
                                                 clone
                     FAILED
syscall[120]
                                                 getdents
                              0xd09cb368
                     FAILED
syscall[141]
                                                  stat64
                     FAILED
                              0xd09cbf80
syscall[195]
                                                 1stat64
                     FAILED
                               0xd09cc080
syscall[196]
                              0xd09cb4dc
                                                  getdents64
syscal1[220]
                     FAILED
RECOVERED 15 Modified syscall table functions
[root@localhost recovery] # ps -ef | grep test
                                      00:00:00 /tmp/test
          1284 1258 0 11:31 pts/1
1345 1288 0 11:33 pts/2
root
                                       00:00:00 grep test
root
{root@localhost recovery]# ls /tmp
ssh-XXAbS7W
ssh-XXEZXD3
test
[root@localhost recovery]# exit
```

Script done on Sun Jan 11 11:33:21 2004

FIG. 36(g)